

Claims

1. A distributed modular input/output system comprising:
 - a primary wireless device adapted to be operatively connected to an associated industrial controller;
 - a secondary wireless device physically disconnected from the primary wireless device, said secondary wireless device operatively connected to the primary wireless device by a primary wireless backplane link;
 - at least one input/output module operatively connected to the secondary wireless device, wherein an associated field device connected to said at least one input/output module is adapted to communicate with the associated industrial controller via said secondary wireless device, said primary wireless backplane link, and said primary wireless device.
2. The distributed modular input/output system as set forth in claim 1, comprising:
 - a plurality of said secondary wireless devices physically disconnected from the primary wireless device and each comprising one or more of said input/output modules operably connected thereto, each of said secondary wireless devices operatively connected to the primary wireless device by a respective plurality of primary wireless backplane links.
3. The distributed modular input/output system as set forth in claim 2, wherein each of said plurality of secondary wireless devices is uniquely identified and wherein said plurality of primary wireless backplane links are established using a shared segment of a radio frequency spectrum.
4. The distributed modular input/output system as set forth in claim 3, wherein said primary wireless backplane links are used respectively by said secondary wireless devices to communicate time-sensitive and time-insensitive data to said primary wireless device.

5. The distributed modular input/output system as set forth in claim 3, wherein each of said plurality of secondary wireless devices comprises a user selectable configuration device that uniquely identifies each of said secondary wireless devices.

6. The distributed modular input/output system as set forth in claim 2, further comprising a plurality of redundant wireless backplane links, each of said redundant wireless backplane links comprising a wireless communication link from a first one of said secondary wireless servant devices to a second one of said secondary wireless devices or from said primary wireless device to one of said secondary wireless devices, wherein said redundant wireless backplane links establish at least one alternative wireless communication path between each secondary wireless device and said primary wireless device.

7. The distributed modular input/output system as set forth in claim 6, wherein each secondary wireless device communicates to said primary wireless device via simultaneous use of one of said primary wireless backplane links and one of said redundant wireless backplane links.

8. The distributed modular input/output system as set forth in claim 2, wherein at least some of said plurality of secondary wireless devices are located in different environments relative to other secondary wireless devices.

9. The distributed modular input/output system as set forth in claim 8, wherein said different environments include at least two of IP-20, IP-65, IP-67.

10. The distributed modular input/output system as set forth in claim 9, wherein at least one of said secondary wireless devices is an intrinsically safe device located in an explosive environment.

11. The distributed modular input/output system as set forth in claim 3, wherein each secondary wireless device comprises a visual display that provides a visual indication of a unique identifier by which said secondary wireless device is uniquely identified.

12. The distributed modular input/output system as set forth in claim 1, wherein said secondary wireless device comprises a wireless link quality indicator that provide visible indicia of quality the primary wireless backplane link.

13. The distributed modular input/output system as set forth in claim 1, wherein said at least one input/output module physically and operatively connected to the secondary wireless module comprises one of: (i) a block input/output module; (ii) a plurality of interconnected modular input/output modules.

14. The distributed modular input/output system as set forth in claim 1, wherein said primary wireless backplane link comprises a radio frequency signal.

15. The distributed modular input/output system as set forth in claim 6, wherein said redundant wireless backplane links are dissimilar from said primary wireless backplane links in terms of at least one of communication type, frequency, and protocol.

16. The distributed modular input/output system as set forth in claim 2, further comprising a user interface device that is selectively connectable to said primary wireless device or one of said secondary wireless devices, said human interface device comprising a visual display that outputs an overall topology of the modular input/output system including said primary wireless device and said plurality of secondary wireless devices, and wherein said primary wireless device and said

secondary wireless devices each output a visual or audio signal when communicating with said user interface device.

17. The distributed modular input/output system as set forth in claim 1, wherein said secondary wireless device comprises a backplane and wherein said at least one input/output module is physically connected to said backplane.

18. The distributed modular input/output system as set forth in claim 2, wherein each of said plurality of secondary wireless devices comprises a backplane and wherein said one or more input/output modules of each of said secondary wireless devices is physically connected to said backplane of its respective secondary wireless device.

19. The distributed modular input/output system as set forth in claim 1, further comprising a network adapter module operatively connected to said primary wireless device, wherein the network adapter module and primary wireless device are located remotely from the associated industrial controller and are adapted to be connected to the associated industrial controller by a hard-wired or wireless network connection.

20. The distributed modular input/output system as set forth in claim 1, wherein the primary wireless device and secondary wireless device communicate with each other via said primary wireless backplane link according to a master-servant relationship where the primary wireless device initiates all communication between itself and the secondary wireless device.

21. The distributed modular input/output system as set forth in claim 1, wherein the primary wireless device and secondary wireless device communicate with each other via said primary wireless backplane link according to a peer-to-peer relationship where either device is adapted to initiate communication with the other.